IEEE
NETSOFT
The 2nd IEEE Conference on Network Softwarization (NetSoft 2016)
Software-Defined Infrastructure for Networks, Clouds, IoT and Services
ADVANCE PROGRAM
6-10 June 2016
Seoul, Korea
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Program At-a-Glance

	Monday, Jun 6				Tuesday, Jun 7		Wednesday, Jun 8		Thursday, Jun 9	Friday, Jun 10			
08:00 :30					Opening Session								
09:00 :30	Workshop #1 (Haegeum B)	Workshop #2 (Haegeum A)	Tutorial #1 (Bipa)	Tutorial #3 (Daegeum)	Keynote Session #1 (Gayageum A)		Keynote Session #2 (Gayageum A)		Keynote Session #3 (Gayageum A)	Workshop #3 (Daegeum)	Workshop #4 (Haegeum B)	Tutorial #5 (Bipa)	Tutorial #7 (Haegeum A)
10:00 :30	Coffee Break						Poster / Demo / Exhibition Coffee Break		Demo / Exhibition Coffee Break	Coffee Break			
11:00 :30	Workshop #1	Workshop #2	Tutorial #1	Tutorial #3	Poster / Demo / Exhibition Coffee Break Plenary Session #1 (Gayageum A)		Plenary Session #3 (Gayageum A)		Plenary Session #5 (Gayageum A)	Workshop #3	Workshop #4	Tutorial #5	Tutorial #7
12:00 :30	Lunch				Demo / Exhibition Lunch		Demo / Exhibition Lunch		Demo / Exhibition Lunch	Lunch			
13:00 :30					Plenary Session #2 (Gayageum A)		Plenary Session #4 (Gayageum A)		Plenary Session #6 (Gayageum A)				
14:00 :30	Workshop #1	Workshop #2	Tutorial #2 (Bipa)	Tutorial #4 (Daegeum)						Workshop #3	Workshop #4	Tutorial #6 (Bipa)	Tutorial #8 (Haegeum A)
15:00 :30	Coffee Break				Poster / Demo / Exhibition Coffee Break		Poster / Demo / Exhibition Coffee Break		Demo / Exhibition Coffee Break	Coffee Break			
16:00 :30	Workshop #1	Workshop #2	Tutorial #2	Tutorial #4	Technical Session #1 (Gayageum A)	Technical Session #2 (Gayageum B)	Technical Session #3 (Gayageum A)	Technical Session #4 (Gayageum B)	Distinguished Experts Panel (Gayageum A)	Workshop #3	Workshop #4	Tutorial #6	Tutorial #8
17:00 :30									Best Paper Awards Closing Session				
18:00 :30	Welcome Reception (Hotel Barbeque Garden)				Gangnam Style Tour		Conference Banquet (Crystal Ballroom)						
19:00 :30													
20:00 :30													

MESSAGE FROM THE NETSOFT 2016 GENERAL CHAIR

Welcome to the 2nd IEEE International Conference on Network Softwarization (NetSoft 2016) being held at The-K Hotel, Seoul, Korea during June 6-10, 2016. NetSoft 2016 builds further on the successful first edition, held in London, UK in April 2015 and is the flagship conference established as part of the IEEE Software-Defined Networks (SDN) Initiative of the IEEE Future Directions Committee. NetSoft is the primary IEEE forum for publication and technical exchange of the latest research and innovation results in this challenging area, and brings together academia and industry to evaluate and ponder maturing developments related to all aspects of network softwarization.

The theme of NetSoft 2016 is *"Softwarization of Networks, Clouds, and Internet of Things"*. With this theme, we have prepared an excellent program consisting of seven keynote speeches from telcos, academia and vendors from around the world, plenary sessions with 20 full papers, 36 technical session papers, distinguished experts panel, exhibitions showcasing the latest solutions from vendors, demos of research prototypes, and posters of ongoing works by researchers. In addition, we are offering six important and timely tutorials on various aspects of network softwarization. We are also co-locating four workshops on the latest hot topics including Software Defined 5G Networks, SDN and IoT, Open-Source Software Networking, and Security in Virtualized Networks.

We have also prepared an excellent social program, starting with the Welcome Reception on Monday evening, a unique and interesting "Gangnam Style" tour on Tuesday evening followed by the Conference Banquet on Wednesday evening with lots of Korean food and entertainment. We hope that you will be able to experience and enjoy the Korean culture, food and interesting places to visit before, during and after the conference.

I would like to express my deepest gratitude to all the dedicated organizing committee members from around the world, technical program committee members for coming up with an excellent technical program. I would also like to thank the IEEE SDN Initiative Members for their great help and guidance. Also, special thanks must go to the board members of SDN/NFV Forum as well as the staff members of KANI, and members of DPNM Lab, POSTECH for their help in organizing and operating this conference. I would also like to thank the patrons (KT, SKT, Huawei, HPE, KulCloud, Atto Research) and financial/technical co-sponsors and endorsement organizations. Without all of their support, NetSoft 2016 would not have been possible. I thank you all!

Enjoy NetSoft 2016 and Dynamic Korea!

James Won-Ki Hong
POSTECH, Korea

MESSAGE FROM THE NETSOFT 2016 TPC CO- CHAIRS

On behalf of the Technical Program Committee (TPC) of the 2nd IEEE International Conference on Network Softwarizarion (NetSoft 2016), it is our pleasure to welcome you to Seoul, Korea. NetSoft 2016 focuses on the theme, “Softwarization of Networks, Clouds, and Internet of Things," presenting recent, emerging approaches and technical solutions for dealing with future softwarized networks, clouds, and IoT infrastructures, as well as with novel services provided on top of these infrastructures. Software-Defined Networks (SDN), Network Function Virtualization (NFV) and Software-Defined Network-based Cloud Computing are different expressions of Software-Defined Infrastructures (SDI). This transformation trend towards softwarization is deeply impacting Telecom and ICT industries. In addition, this trend is also transforming several other industries, bringing softwarization to optimize costs and processes and to bring new values in the infrastructures. In particular, SDN, NFV and network programmability are creating the conditions to reinvent network and service architectures.

A total of 107 papers were submitted (74 full papers and 33 short papers) by authors from 32 different countries. All submitted papers underwent a rigorous review process with at least 3, but usually 4 reviews for each paper. After author rebuttals were submitted, a TPC meeting took place, where every paper was discussed taking into account its content, the reviews and the submitted rebuttal. From the 107 submitted papers, 20 full papers were accepted for the plenary session track and 36 promising papers were accepted for the technical session track.

The aforementioned papers – covering the topics such as efficient resource management and orchestration, service function chains for softwarized infrastructures, management of SDN/NFV-based systems, monitoring of softwarized networks, testbeds and experiments, traffic engineering in softwarized networks, quality guarantees in softwarized environments, transition strategies and pricing models – will be presented, along the week, in 6 plenary sessions and 4 technical sessions. The program is also composed of 7 keynotes by distinguished speakers, 8 tutorials, 4 workshops, a distinguished expert panel, together with interactive demo/poster/exhibition sessions during the breaks. It is our sincere hope that you will truly enjoy the event and take advantage of the content-rich and inspiring program.

NetSoft 2016 owes its success in large part to a dedicated community from industry and academia. We wish to thank the authors of the submitted papers. We also wish to thank the members of the TPC and the additional reviewers for their constructive and detailed reviews. A special “thank you” goes to the entire OC for their great help and constructive ideas. In particular, we want to express our sincere gratitude to the General Chair, Prof. James Won-Ki Hong, and the Chair of the Steering Committee, Dr. Prosper Chemouil, for their excellent guidance and support throughout the entire process.

Best regards and enjoy NetSoft 2016 in Seoul!

Filip De Turck
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Belgium

Joon-Myung Kang
Hewlett Packard Labs
USA

Hyunseung Choo
Sungkyunkwan University,
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Keynotes

Keynote Session #1: Tuesday, 7th June 2016 – 9:00-11:00

Vision and Issues for Network Softwarization

Dongmyun Lee, CTO & SEVP, KT, Korea

Abstract The first generation of Software-Defined Networking (SDN) and Network Function Virtualization (NFV) has been focused on performance enhancement of networking software against that of dedicated-hardware. Global operators and vendors have tried to deploy SDN/NFV based on their own innovation strategies and core competencies. Those commercial cases include enterprise network virtualization, operator's central office virtualization, mobile core network virtualization, transport SDN, WAN-scale NFV, and much more. Based on those experiences, they are analyzing new requirements and setting up strategies for the next generation SDN and NFV commercialization. This talk introduces the experiences of SDN and NFV trials, then addresses new requirements, issues and perspectives for commercializing next generation SDN and NFV. Notable areas include end-to-end orchestration, operation-and-maintenance, third-party solution integration, standardized evaluation, and so on. They envision sustainable SDN/NFV commercialization system with virtuous circular scheme for networking and IT integrated development and operation.

Bio Dongmyun Lee is currently CTO and Head of the Institute of Convergence Technology in KT. He joined KT in 1991 and has worked in networking areas including ATM, broadband network management, CDN, and enterprise total service businesses until 2002. After leading the technology strategy team during 2003~2004, he has been in charge of BcN (Broadband Convergence Network) group in KT until 2007. During 2008~2010, he led the development of next generation residential and enterprise services. Starting from 2011, he has been in charge of the technology strategy and the network/service innovation initiative in KT. He received the B.S. degree in Electrical Engineering from SNU in 1985 and the M.S. and Ph.D. degrees in Electrical Engineering from KAIST in 1987 and 1991, respectively. His main research areas were real-time distributed operating system and parallel computing.

Software Defined RAN Evolution: Challenges and Opportunities

Alex Jinsung Choi, CTO & EVP, SKT, Korea

Abstract Mobile Traffic has increased rapidly and the amount of traffic varies according to time, place, and big event. It is difficult for operators to cope with the change of traffic using legacy RAN, because it has the H/W centric structure. This stiff structure leads to high cost when the operators try to reallocate radio resources dynamically. To increase radio resource utilization and reduce TCO, Rearchitecture of RAN (referred to SDRAN) is required. This new architecture is characterized by open H/W, open S/W, user plane-control plane separation, L1 split and business enabling platform (MEC: Mobile Edge Cloud). SDRAN will have challenges such as mission critical requirement, real time processing, and capacity issues. To meet those challenges, SK Telecom is developing a SDRAN trial system and leading the global ecosystem: OCP, TIP, and ON.Lab

Bio Dr. Alex Jinsung Choi is serving as CTO, Executive Vice President and Head of Corporate R&D Center. He joined SK Telecom in 2012 as Executive Vice President and Head of Technology Strategy Office. He is responsible for building the company's technology roadmaps and strategies aimed at securing technology leadership in the rapidly-evolving mobile marketplace. In line with the company's efforts to open a new 5G era, his focus is currently on developing next generation network and future ICT technologies including 5G, NFV/SDN, SDDC, Hadoop, Cloud & Big Data, Quantum Communication, Video Cloud, Media and IoT. Before joining SKT, he held various key positions at LG Electronics including EVP & Head of Mobile Communications Business Unit, EVP & Head of Mobile Core Technology Lab and SVP & Head of Next-Generation Telecommunications Lab. Choi is credited with developing the world's first LTE handset modem chip and launching LG's first Android smartphone. He received his Bachelor's degree in Control and Instrumentation Engineering from SNU; and MS in Computer Engineering and PhD in Electrical Engineering from USC.

SDX: E2E Architecture of 5G

Chih-Lin I, Chief Scientist, China Mobile, China

Abstract 5G network is anticipated to meet the extremely challenging and diverse requirements of mobile traffic in the 2020's in various deployment scenarios, which are characterized by super high data rate, low latency, high mobility, high-energy efficiency, and high-traffic density. For a sustainable development of CT industry, much shorter time to market, much faster turnaround of new network capabilities, and more flexible and more efficient network operation are required. Soft is a paramount E2E theme towards a "Soft, Green and Super-Fast" 5G. CMCC's 5G R&D activities followed several innovative R&D themes: 1) Rethinking Shannon to start a green journey on wireless systems; 2) Rethinking Ring & Young for no more "cells"; 3) Rethinking signaling & control to make network applications and load-aware; 4) Rethinking antennas to make base stations "invisible" via SmarTiles; 5) Rethinking spectrum & air interface to enable wireless signals to "dress for the occasion"; 6) Rethinking fronthaul to enable Soft RAN via next generation fronthaul interface (NGFI); and 7) Rethinking the protocol stack for flexible configurations of diversified access points and user-centric resource allocation. Based on the innovative R&D themes, an E2E 5G network architecture of CMCC is proposed, featured by software defined core network with network function virtualization, user-centric soft RAN with flexible multi-connectivity, protocol stack and fronthaul interface function split, and software defined air interface to meet the diverse demands by reconfiguring combinations of the physical layer building blocks. This talk will give an overview of CMCC's 5G E2E network architecture and key technical enablers.

Bio Chih-Lin I received her Ph.D. degree in EE from Stanford University. She has been working at multiple world-class companies and research institutes leading the R&D, including AT&T Bell Labs; Director of AT&T HQ, Director of ITRI Taiwan, and VPGD of ASTRI Hong Kong. In 2011, she joined China Mobile as its Chief Scientist of wireless technologies, established the Green Communications Research Center, and launched the 5G Key Technologies R&D. She is spearheading major initiatives including 5G, C-RAN, high-energy efficiency system architectures, technologies and devices; and green energy. She was a Professor at NCTU, an Adjunct Professor at NTU, and currently an Adjunct Professor at BUPT. She is Chair of FuTURE 5G SIG, an Executive Board Member of GreenTouch, a Network Operator Council Founding Member of ETSI NFV, a Steering Board Member of WWRF, a member of IEEE ComSoc SDB, SPC, and CSCN-SC, and a Scientific Advisory Board Member of Singapore NRF.

Keynote Session #2: Wednesday, 8th June 2016 – 9:00-10:30

CORD: Central Office Re-architected as a Datacenter

Guru Parulkar, Founder/Executive Director of ON.Lab, USA

Abstract CORD (Central Office Re-architected as a Datacenter, http://opencord.org) combines NFV, SDN, and the elasticity of commodity clouds to bring datacenter economics and cloud agility to the Telco Central Office. CORD lets the operator manage their Central Offices using declarative modeling languages for agile, real-time configuration of new customer services. CORD leverages all OCP hardware and merchant silicon and white boxes for CO fabric, servers, and access; open source platforms such as OpenStack, Docker, ONOS, and XOS; and a set of open and closed services. Major service providers like AT&T, SK Telecom, Verizon, China Unicom and NTT Communications and a long list of vendors and systems integrators are already supporting CORD. The CORD partnership has created and demonstrated three versions of CORD: (1) Residential-CORD for residential customers over GPON (2) Mobile-CORD for mobile customers with disaggregated and virtualized RAN and EPC and mobile edge computing; and (3) Enterprise-CORD to support enterprise customers with MEF and SD-WAN services including virtual network on demand. The CORD partnership plans to create and support open reference implementation of [R,E,M]CORD for the community to use and build on. The talk will provide an overview of CORD, its progress so far and the future plans.

Bio Guru Parulkar is Executive Director of Open Networking Research Center, Executive Director of Open Networking Lab, and Consulting Professor of EE at Stanford University. Guru has been in the field of networking for over 25 years. He joined Stanford in 2007 as Executive Director of its Clean Slate Internet Design Program. At Stanford, Guru helped create three programs: OpenFlow/SDN, Programmable Open Mobile Internet 2020, and Stanford Experimental Data Center Laboratory. Prior to Stanford, Guru spent four years at NSF and worked with the broader research community to create programs such as GENI, Future Internet Design, and Network of Sensor Systems. Guru received NSF Director's award for Program Management excellence. Before NSF Guru founded several startups including Growth Networks (acquired by Cisco) and Sceos (IPO'd as Ruckus Wireless). Guru served as Entrepreneur in Residence at NEA in 2001. Prior to this Guru spent over 12 years at Washington University in St. Louis where he was a Professor of Computer Science, Director of Applied Research Laboratory and the head of research and prototyping of high performance networking and multimedia systems. Guru received his PhD in Computer Science from the University of Delaware in 1987.

Application-Driven Network Softwarization

Aki Nakao, University of Tokyo,

Abstract Network softwarization is an overall transformation trend for designing, implementing, deploying, managing and maintaining network equipment and network components by software programming, exploiting characteristics of software such as flexibility and rapidity of design, development and deployment throughout the lifecycle of network equipment and components. In this keynote speech, we discuss the recent design and development of highly flexible infrastructure driven by end-to-end application quality, utilising the concept of network softwarization, especially, for next generation mobile network infrastructure.

Bio Prof. Dr. Akihiro NAKAO received B.S.(1991) in Physics, M.E.(1994) in Information Engineering from the University of Tokyo. He was at IBM Yamato Laboratory, Tokyo Research Laboratory, and IBM Texas Austin from 1994 till 2005. He received M.S.(2001) and Ph.D.(2005) in Computer Science from Princeton University. He is a full professor and also a department chair at Interfaculty Initiative in Information Studies, Graduate School of Interdisciplinary Information Studies, University of Tokyo. He has also been appointed by the Japanese government as a chairman of network architecture committee of the fifth generation mobile network promotion forum (5GMF) in Japan.

Keynote Session #3: Thursday, 9th June 2016 – 9:00-10:30

Network Function Virtualization and Flexible Service Chaining in Multi-Domain/Provider Environments: Recent Developments

Robert Szabo, Ericsson, Hungary

Abstract Cloud networks provide various services on top of virtualized compute and storage resources. The flexible operation and optimal usage of the underlying infrastructure are realized by resource orchestration methods and virtualization techniques. In contrast, service deployment and service provisioning in carrier networks have several limitations in terms of flexibility, scalability or optimal resource usage as the built-in mechanisms are strongly coupled to the physical topology and special purpose hardware elements. NFV opens the door between cloud and carrier networks by providing software-based telecom services, which can run in virtualized environment on general purpose hardware. Our goals are to unify software and network (service chaining) resource management into a common framework that could be used for end-to-end service creation. In the framework of the EU-FP7 UNIFY project we created novel architecture supporting automated, dynamic service creation based on a fine-granular service chaining model, SDN and cloud virtualization techniques. As a sequel, in the scope of the EU H2020 5G PPP program's 5G Exchange project, we work on multi-provider extensions to enable dynamic NFV and SFC services across multiple provider domains. The talk will summarize recent developments and some learning based on corresponding proof of concept prototype implementations.

Bio Róbert Szabó, PhD is a master researcher at Ericsson Research, Hungary since 2013. At Ericsson, he is the technical coordinator of the EU-FP7 integrated project: Unifying Cloud and Carrier Networks (UNIFY) and the Project Coordinator of the H2020 5G-PPP 5G Exchange innovation action. He was the president of the Telecommunications Section of the Scientific Association for Infocommunications, Hungary (2005-2007). He was the deputy head of the TMIT, BME (2008-2010) and Head of the High Speed Networking Lab at BME (2007-2012). His research was supported by the János Bolyai Scholarship of the Hungarian Academy of Science. He is co-author of over 80 publications. His current research focus is on software defined networking, network functions virtualization and service function chaining. He is one of the editors of the policy-based research management area draft at IRTF NFVRG.

NetroSphere and NetworkAnalytics – Innovation of network architecture and operation beyond SDN/NFV evolution

Kohei Shiomoto, NTT Labs, Japan, Chair of IRTF SDN RG

Abstract We are proposing NetroSphere concept to achieve component-level disaggregation and assembly beyond SDN/NFV to create healthy sustainable ecosystem where new players can join without any barriers. NetworkAnalytics is a key enabler of NetsroSphere concept, where we understand what's going on network by analyzing diversified kinds of data collected from inside and outside of networks and to provide value to two-sides: end-users and service providers. We are pursuing inter-disciplinary research framework by combining research fields such as machine learning/control/ information/optimization/graph/queuing theory, statistical analysis, etc. Traffic data, syslog data, and Twitter data are analyzed for various network operations: traffic-engineering, trouble-shooting, QoE-sentiment analysis. This keynote provides an overview of R&D activities on NetroSphere and NetworkAnalytics conducted in NTT R&D labs.

Bio Kohei Shiomoto is Senior Manager of Communication & Traffic Service Quality Project, NTT Network Technology Laboratories, NTT, Tokyo, Japan. He joined NTT in 1989. He has been engaged in R&D of high-speed networking including ATM, IP, (G)MPLS, and IP+Optical networking in NTT labs. In 1996-1997, he was a visiting scholar at Washington University in St. Louis, USA. Since July 2012, he has been leading Communication & Traffic Service Quality Project of NTT Network Technology Laboratories, Japan. He received the B.E., M.E., and Ph.D degrees in information and computer sciences from Osaka University, Osaka in 1987, 1989, and 1998, respectively. He is a Fellow of IEICE, a Senior Member of IEEE, and a member of ACM.

Distinguished Experts Panel

Thursday, 9th June 2016 – 16:00-17:30 (Moderator: Prosper Chemouil, Orange, France)

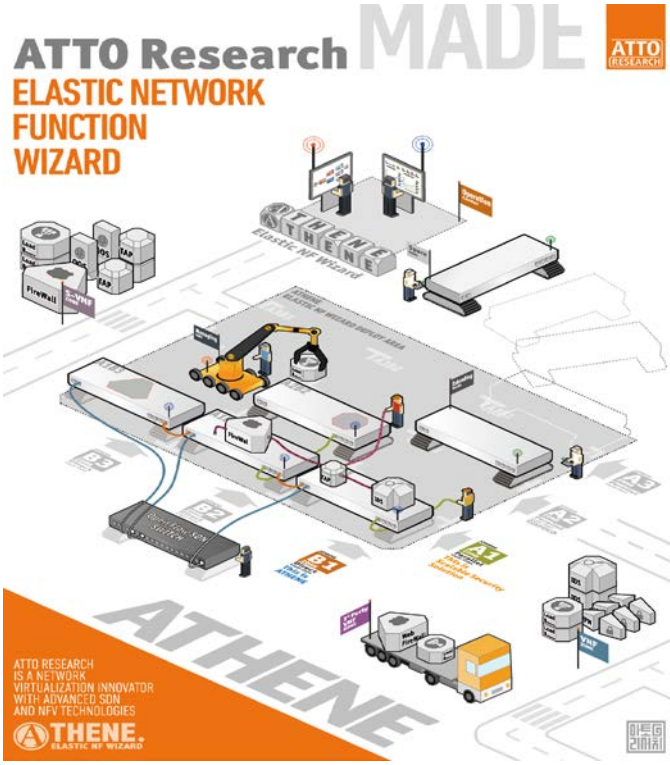
Network Softwarization Towards the Edge: Where is the Frontier?

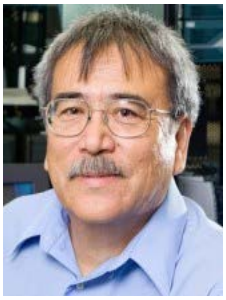
Prosper Chemouil, *Orange, France*

Prosper graduated from *École Nationale Supérieure de Mécanique de Nantes* (now *Ecole Centrale de Nantes*) in 1975 and obtained PhD in control theory in 1978. He joined the *Teletraffic and Network Planning* Section of the then *Centre National d'Études des Télécommunications* (CNET, now *Orange Labs*) late 1980. In 1993, he became the Head of the "*Network Management and Traffic Engineering*" Department until the end of 1998. He was a Research Program Director in the area of *Traffic Modelling, Network Control and Protocol Evaluation*. During this period, he had been involved in various theoretical research activities regarding traffic modelling and control. Outcomes have been implemented in several projects dealing with the design and operations of telecommunications networks and services, with a specific emphasis on dynamic routing and network management. He was a Research Program Director on Post-IP networks until 2012, and he has been appointed Expert Program Leader on ***Future Networks*** for the whole Orange Group in 2010. His main interests are with the design and management of Future Networks and Technologies and their impact on network architecture, traffic engineering and control, and performance and QoS. Recently, he has been involved in new networking paradigms like information-centric, programmable and autonomic networking. He has been a co-founder of NetSoft and chaired the 1st NetSoft in 2015. Prosper is the recipient of the Salah Aidarous Memorial Award (2014) and Arne Jensen Lifetime Achievement Award (2015), and Fellow of IEEE.

Guru Parulkar, *ON.Lab, USA*

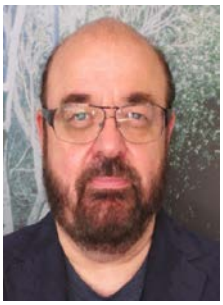
(See Guru's biography on page 7)





Alberto Leon-Garcia, *University of Toronto, Canada*

Professor Alberto Leon-Garcia is Distinguished Professor in Electrical and Computer Engineering at the University of Toronto. He is a Fellow of the Institute of Electronics an Electrical Engineering "For contributions to multiplexing and switching of integrated services traffic". He is also a Fellow of the Engineering Institute of Canada and the American Association for the Advancement of Science. He has received the 2006 Thomas Eadie Medal from the Royal Society of Canada and the 2010 IEEE Canada A. G. L. McNaughton Gold Medal for his contributions to the area of communications. Professor Leon-Garcia is author of the textbooks: Probability and Random Processes for Electrical Engineering, and Communication Networks: Fundamental Concepts and Key Architecture. He is currently Scientific Director of the NSERC Strategic Network for Smart Applications on Virtual Infrastructures. He also leads the ORF project on Connected Vehicles and Smart Transportation. He was founder and CTO of AcceLight Networks in Ottawa, Canada.



Alex Galis, *University College London, UK*

Alex Galis (www.ee.ucl.ac.uk/~agalis) is a Professor In Networked and Service Systems at University College London (UCL). He has co-authored 10 research books and more that 200 publications in the Future Internet areas: system management, networks and services, networking clouds, 5G virtualization and programmability. He participated in a number of EU projects including overall technical leadership of the MISA – Management of IP networks, FAIN – programmable networks, CONTEXT – context aware networking and AUTONOMIC INTERNET – autonomic networking projects. He was a member of the Steering Group of the Future Internet Assembly (FIA) and he led the Management and Service–aware Networking Architecture (MANA) working group at FIA. He acted as PTC chair of 14 IEEE conferences including TPC co-chair of IEEE Network Softwarization 2015 (NetSoft 2015 http://sites.ieee.org/netsoft/) and reviewer in more than 100 IEEE conferences. He also acted as a Vice-Chair of the ITU-T SG13 Group on Future Networking (www.itu.int/ITU-T/focusgroups/fn/index.html). He is currently the Co-Chair of the IEEE SDN publication committee (http://sdn.ieee.org).

Kohei Shiomoto, *NTT, Japan*

Kohei Shiomoto is Senior Manager of Communication & Traffic Service Quality Project, NTT Network Technology Laboratories, NTT, Tokyo, Japan. He joined NTT in 1989. He has been engaged in R&D of high-speed networking including ATM, IP, (G)MPLS, and IP+Optical networking in NTT labs. In 1996-1997, he was a visiting scholar at Washington University in St. Louis, USA. Since July 2012, he has been leading Communication & Traffic Service Quality Project of NTT Network Technology Laboratories, Japan. He received the B.E., M.E., and Ph.D degrees in information and computer sciences from Osaka University, Osaka in 1987, 1989, and 1998, respectively. He is a Fellow of IEICE, a Senior Member of IEEE, and a member of ACM

Jaewoong Chung, *Atto Reasearch, Korea*

Dr. Jaewoong Chung is the CEO of Atto Research, specialized in software defined network and network function virtualization. He is leading Atto Research's efforts to develop market-leading products based on SDN/NFV technologies. He worked on next-generation x86 architecture and heterogeneous computing as a senior scientist at Intel Labs from 2010 to 2012. He developed new x86 architecture for die stacking, AMD64 extension, and many-core processors for cloud computing at AMD from 2008 to 2010. He developed J2EE Web Application Server at Tmaxsoft from 2001 to 2004 and worked on a GPS-based auto navigation system at Samsung from 1999 to 2000. His research interest spans transactional memory, parallel programming, chip multi-processor. He received the bachelor's degree and the M.S. degree from KAIST, and the Ph.D. degree of electrical engineering from Stanford University.

Plenary & Technical Sessions

▶ Tuesday, June 7, 2016

11:30AM – 12:30PM Full Papers (Gayageum A Hall)	**PS1: Service Function Chains for NFV** *Chair: Olivier Festor, TELECOM Nancy, France*
	Ready-to-Deploy Service Function Chaining for Mobile Networks Roberto Bifulco, Anton Matsiuk, Alessio Silvestro, *NEC Laboratories Europe, Germany*
	Placement of Services with Flexible Structures Specified by a YANG Data Model Sevil Mehraghdam, Holger Karl, *Paderborn University, Germany*
1:30PM – 3:30PM Full Papers (Gayageum A Hall)	**PS2: Resource management and Orchestration** *Chair: Alex Galis, UCL, UK*
	A Dilated-CPU-Consumption-Based Performance Prediction for Multi-Core Software Routers Kalika Suksomboon, Shuichi Okamoto, Michiaki Hayashi, *KDDI R&D Laboratories, Inc., Japan,* Masaki Fukushima, *KDDI Corporation, Japan*
	Semantic Validation of Affinity Constrained Service Function Chain Requests Niels Bouten, Maxim Claeys, *Ghent University – iMinds, Belgium* Rashid Mijumbi, *Waterford Institute of Technology, Ireland* Jeroen Famaey, Steven Latré, *University of Antwerp - iMinds, Belgium* Joan Serrat, *Universitat Politècnica de Catalunya, Spain*
	Vertex-Centric Computation of Service Function Chains in Multi-domain Networks Qiong Zhang, Xi Wang, Kim Inwoong, Paparao Palacharla, Tadashi Ikeuchi, *Fujitsu Lab of America, USA*
	Proactive Failure Recovery Scheme for Data Traffic in Software Defined Networks Pankaj Thorat, Rajesh Challa, S. M. Raza, Hyunseung Choo, *Sungkyunkwan University, Korea* Dongsoo S. Kim, *Indiana University-Purdue University, USA*
4:00PM – 6:00PM Parallel Session Papers (Gayageum A Hall)	**TS1: Network Function Virtualization** *Chair: George Xilouris, NCSR Demokritos, Greece*
	An Integrating Framework for Efficient NFV Monitoring Georgios Gardikis, Ioannis Koutras, George Mavroudis, Socrates Costicoglou, *Space Hellas S.A., Greece,* George Xilouris, Christos Sakkas, Michail Alexandros Kourtis, *NCSR "Demokritos", Greece*
	E-State: Distributed State Management in Elastic Network Function Deployments Manuel Peuster, Holger Karl, *University of Paderborn, Germany.*
	Optimal Network Resource Utilization in Service Function Chaining Insun Jang, Sukjin Choo, Myeongsu Kim, Sangheon Pack, *Korea University, Korea* Myung-Ki Shin, *ETRI, Korea.*
	A Survey on Security in Network Functions Virtualization Wei Yang, Carol Fung, *Virginia Commonwealth University, USA.*
	Performance Management Challenges for Virtual Network Functions Wei Zhang, Timothy Wood, *George Washington University, USA* Jinho Hwang, Shriram Rajagopalan, *IBM T.J. Watson Research Center, USA* K. K. Ramakrishnan, *University of California, Riverside, USA*
	SDN Based Inter-domain Mobility for PMIPv6 with Route Optimization Syed M. Raza, Pankaj Thorat, Rajesh Challa, Hyunseung Choo, *SKKU., Korea* Dongsoo Kim, *Indiana University-Purdue University Indianapolis, USA.*
	Orchestrating Distributed Mode of NFV Kotaro Kataoka, Uttam Dhabas, Om Prakash Nirankari, Naman Grover, *IIT Hyderabad, India.*
	LightChain: A Lightweight Optimisation of VNF Placement for Service Chaining in NFV Anish Hirwe, Kotaro Kataoka, *Indian Institute of Technology Hyderabad, India.*

	Segmented Proactive Flow Rule Injection for Service Chaining Using SDN Prakash B. Pawar, Kotaro Kataoka, *Indian Institute of Technology Hyderabad, India.*
4:00PM – 6:00PM Parallel Session Papers (Gayageum B Hall)	**TS2: Software Defined Networking** *Chair: Roberto Riggio, Create-net, Italy*
	Developing an Implementation Framework for the Future Internet using the Y-Comm Architecture, SDN and NFV Glenford Mapp, *Middlesex University, UK,* Fragkiskos Sardis, *Kings College London, UK* Jon Crowcroft, *University of Cambridge, UK*
	Supporting Multicast and Broadcast Traffic for Groups of Connected Devices Dinh Thai Bui, Richard Douville, Mathieu Boussard, *Nokia Bell Labs, France*
	A Generic Interface for Open vSwitch Dinh Thai Bui, Kahina Aberkane, *Nokia Bell Labs, France.*
	Dynamic Adaptive Advance Bandwidth Reservation in Media Production Networks Maryam Barshan, Hendrik Moens, Bruno Volckaert, *Ghent University, Belgium*
	How to Handle ARP in a Software-Defined Network Roberto di Lallo, Gabriele Lospoto, Massimo Rimondini, Giuseppe Di Battista, *Roma Tre Univ., Italy*
	Dynamic Management of Control Plane Performance in Software-Defined Networks Burak Görkemli, Murat Parlakisik, Seyhan Civanlar, Aydın Ulaş, Argela, TurkeyAhmet Murat Tekalp, *Koc University, Turkey.*
	Energy aware routing and traffic management for software defined networks Berna Özbek, Yiğitcan Aydoğmuş, *Izmir Institute of Technology, Turkey* Aydın Ulaş, Burak Görkemli, Kazim Ulusoy, *Argela, Turkey*
	Online Resource Mapping for SDN Network Hypervisors using Machine Learning Christian Sieber, Arsany Basta, Andreas Blenk, Wolfgang Kellerer, *TUM, Germany*
	Linear Programming Approaches for Power Savings in Software-defined Networks Fahimeh Alizadeh Moghaddam, *UvA/VU, The Netherlands* Paola Grosso, *University of Amsterdam, The Netherlands.*

▶ Wednesday, June 8, 2016

11:00AM – 12:30PM Full Papers (Gayageum A Hall)	**PS3: Resource management and Orchestration** *Chair: Yoshiaki Kiriha, NEC, Japan*
	Automated Generation of VNF Deployment Rules Using Infrastructure Affinity Characterization Vincenzo Riccobene, Michael McGrath, *Intel Labs Europe, Ireland* Michail-Alexandros Kourtis, George Xilouris, Harilaos Koumaras, *NCSR "Demokritos", Greece*
	Comparing Topology and Stream Based Strategies for Modeling Service Function Chains Hendrik Moens, Bruno Volckaert, *Ghent University, Belgium*
	TeNOR: Steps Towards an Orchestration Platform for Multi-PoP NFV Deployment Jordi Ferrer Riera, Josep Batallé, *Fundació i2CAT, Internet i Innovació Digital a Catalunya, Spain* José Bonnet, Miguel Días, *Portugal Telecom Innovaçao e Sistemas, Portugal* Michael McGrath, Giuseppe Petralia, *Intel Corporation, Ireland* Francesco Liberati, *eCampus University, Italy* Alessandro Giuseppi, Antonio Pietrabissa, *Consorzio per la Ricerca nell'Automatica e Telecomunicazione, Italy.* Alberto Ceselli, Alessandro Petrini, Marco Trubian, *University of Milano, Italy* Panagiotis Papadimitrou, David Dietrich, *Leibniz University Hannover, Germany* Aurora Ramos, Javier Melian, *ATOS Spain, Spain* George Xilouris, Akis Kourtis, Tasos Kourtis, *NCSR Demokritos, Greece* Evangelos K. Markakis, *Technological Educational Institute of Crete, Greece*

1:30PM – 3:30PM Full Papers (Gayageum A Hall)	**PS4: Network and service monitoring for SDN / NFV** *Chair: Hendrik Moens, Ghent University-iMinds, Belgium*
	Recursively Querying Monitoring Data in NFV Environments Xuejun Cai, Catalin Meirosu, Wolfgang John, *Ericsson Research, Sweden*
	RADIator – An Approach for Controllable Wireless Networks Radoslaw Cwalinski, Hartmut Koenig, *Brandenburg University of Technology Cottbus-Senftenberg, Germany.*
	Measurement and Analysis of Application-Level Crowd-Sourced LTE and LTE-A Networks Jonghwan Hyun, Jae-Hyoung Yoo, James Won-Ki Hong, *POSTECH, Korea* Youngjoon Won, *Hanyang University, Korea*
	Self-Modeling based Diagnosis of Services over Programmable Networks José Manuel Sánchez, Imen Grida Ben Yahia, *Orange Labs, France* Noël Crespi, *Telecom SudParis, France*
4:00PM – 6:00PM Parallel Session Papers (Gayageum A Hall)	**TS3: Testbed / Experiment / Traffic Engineering for SDN / NFV** *Chair: Woojin Seok, KISTI, Korea*
	SDIGraph: Graph-based Management for Converged Heterogeneous Resources in SDI Joon-Myung Kang, *Hewlett Packard Labs, USA* Hadi Bannazadeh, Alberto Leon-Garcia, *University of Toronto, Canada*
	JANUS: Design of a Software-Defined Infrastructure Manager and Its Network Control Architecture, Byungchul Park, Thomas Lin, Hadi Bannazadeh, Alberto Leon-Garcia, *University of Toronto, Canada*
	An Orchestrator of Network and Cloud Resources for Dynamic Provisioning of Mobile Virtual Network Functions, M. Gharbaoui, I. Cerutti, P. Castoldi, *Scuola Superiore Sant'Anna, Italy* B. Martini, *CNIT, Italy*
	FLAME: Flow Level Traffic Matrix Estimation using Poisson Shot-Noise Process for SDN Yoonseon Han, Taeyeol Jeong, Jae-Hyoung Yoo, James Won-Ki Hong, *POSTECH, Korea*
	Iterative Traffic Engineering in the Data Plane of Multimedia IP Communications Lilin Zhang, Ali Tizghadam, Hadi Bannazadeh, Alberto Leon-Garcia, *University of Toronto, Canada*
	(Literally) above the clouds: virtualizing the network over multiple clouds Max Alaluna, Fernando Ramos, Nuno Neves, *University of Lisboa, Portugal*
	Performance Benchmarking of SDN Experimental Platforms Philippos Isaia, Lin Guan, *Loughborough University, UK*
	A Generic Framework to Support Application-Level Flow Management in Software-Defined Networks Lautaro Dolberg, Thomas Engel, *SnT - University of Luxembourg, Luxemburg* Jérôme François, *INRIA Nancy Grand Est, France* Shihabur Chowdhury, Reaz Ahmed, Raouf Boutaba, *University of Waterloo, Canada*
	SDN controller for Network-aware Adaptive Orchestration in Dynamic Service Chaining Ahmed Ali Mohammed, Molka Gharbaoui, Piero Castoldi, *Scuola Superiore Sant'Anna, Italy* Barbara Martini, Federica Paganelli, *CNIT, Italy*
	Exploiting Integrated GPUs for Network Packet Processing Workloads Janet Tseng, Ren Wang, James Tsai, Saikrishna Edupuganti, Alexander W. Min, Stephen Junkins, Tsung-Yuan Charlie Tai, *Intel Labs., USA,* Shinae Woo, *KAIST, Korea*
	Experiments on SDN-based Network and Cloud Resource Orchestration in FED4FIRE M. Gharbaoui, D. Adami, P. Castoldi, *Scuola Superiore Sant'Anna, Italy* B. Martini, *CNIT, Italy,* S. Giordano, *University of Pisa, Italy*
4:00PM – 6:00PM	**TS4: SDN / NFV for CDN / Wireless / WAN** *Chair: Taekyoung Kwon, SNU, Korea*
	Dynamic aggregation of traffic flows in SDN Angelos Mimidis, Cosmin Caba, José Soler, *DTU, Denmark*

Parallel Session Papers (Gayageum B Hall)	Congestion-based API for Cloud and WAN Resource Optimization Ali Sanhaji, Philippe Niger, Philippe Cadro, Cédric Ollivier, *Orange Labs, France* André-Luc Beylot, *ENSEEIHT, IRIT, France.*
	SDN-based vs. software-only EPC Gateways: a Cost Analysis Xueli An, *Huawei Technologies, Germany* Wolfgang Kiess, *DOCOMO Euro-Labs, Germany* József Varga, Johannes Prade, Hans-Jochen Morper, Klaus Hoffmann, *NOKIA, Germany.*
	A Software-Defined Networking Architecture for Aerial Network Optimization Hammad Iqbal, Jamie Ma, Kenneth Stranc, Kenneth Palmer, Peter Benbenek, *The MITRE Corporation, USA*
	Policy-Driven vCPE Through Dynamic Network Service Function Chaining Vitor A. Cunha, Igor D. Cardoso. *Instituto de Telecomunicações, Portugal* João P. Barraca, Rui L. Aguiar, *Universidade de Aveiro, Portugal*
	Exploiting Integrated GPUs for Network Packet Processing Workloads Janet Tseng, Ren Wang, James Tsai, Saikrishna Edupuganti, Alexander W. Min, Stephen Junkins, Tsung-Yuan Charlie Tai, *Intel Labs., USA,* Shinae Woo, *KAIST, Korea*
	Configuration of the Wireless Interface for Software Defined Wireless Networks Osianoh Aliu, Mathais Kretschmer, *Fraunhofer FIT, Germany* Christian Niephaus, *Brunel University, Germany*
	Network-Coding-based Multipath Transmission in Software Defined Fiber-Wireless Networks Xin Liu. Wenzhu Li, *Hebei University of Engineering, China* Muriel Médard, *Massachusetts Institute of Technology, USA*

▶ Thursday, June 9, 2016

11:00AM – 12:30PM Full Papers (Gayageum A Hall)	**PS5: Traffic Engineering and QoS / QoE in SDN / NFV** *Chair: Kohei Shiomoto, NTT, Japan*
	Towards Dynamic MPTCP Path Control using SDN Hyunwoo Nam, Henning Schulzrinne, *Columbia University, USA* Doru Calin, *Nokia Bell Labs, USA*
	SPIDER: Fault Resilient SDN Pipeline with Recovery Delay Guarantees Carmelo Cascone, Antonio Capone, *Politecnico di Milano, Italy* Luca Pollini, Davide Sanvito, *CNIT, Italy* Brunilde Sansò, *Ecole Polytechnique de Montreal, Canada*
	Fast and efficient bandwidth-delay constrained routing algorithm for SDN networks Slavica Tomovic, Igor Radusinovic, *University of Montenegro, Montenegro*
1:30PM – 3:30PM Full Papers (Gayageum A Hall)	**PS6: Transition, Pricing, and Protocols** *Chair: Jerome Francois, INRIA, France*
	Intelligent Eviction Strategy for Efficient Flow Table Management in OpenFlow Switches Rajesh Challa, Yongseung Lee, Hyunseung Choo, *Sungkyunkwan University, Korea*
	Towards a Programmable Management Plane for SDN and Legacy Networks Christian Sieber, Andreas Blenk, Arsany Basta, Wolfgang Kellerer, *Technical University of Munich, Germany,* David Hock, *Infosim GmbH & Co. KG, Germany*
	A Dynamic Pricing Algorithm for a Network of Virtual Resources Bram Naudts, Sofie Verbrugge, Didier Colle, *Gent University, Belgium* Mario Flores, Joan Serrat, *Universitat Politècnica de Catalunya, Spain* Rashid Mijumbi, *Waterford Institute of Technology, Ireland*
	Application Specific Optimization: Rethinking Protocol Layering and Standards John Peng, Stephen Wilson, *University of Virginia, USA*

Demos

GÉANT SDX - SDN based Open eXchange Point

Abstract. In this demo, we will present the SDNization of GÉANT Open service, which is currently delivered through a set of Open eXchange Points (OXP) based on traditional (non-SDN) solutions. The live demo is based on remote access to the real prototype which runs in the GÉANT Cambridge Lab. During the demo we will show how an operator can deploy the services and how the SDN network can be monitored and managed. Finally, we will demonstrate how the infrastructure is able to automatically manage network events and adapt to network changes.

AutoSecSDNDemo: Demonstration of Automated End-to-End Security in Software-Defined Networks

Abstract. The complexity of modern communication networks and innovative cyber-attacking methods make it difficult to automatically detect and prevent attacks. In this demo we show a novel approach to integrate end-to-end security into an SDN.

Wireless Backhaul for Mobile Edge Computing

Abstract. The purpose of this demonstration is to show a flexible wireless backhaul network and how it seamlessly integrates with an open source cloud platform for managing edge computing servers. We will demonstrate how information is exchanged between the radio network and the edge server. The use case will show the benefit of radio network information in Mobile Edge Computing.

THESARD: on The road to resiliencE in SoftwAre-defined networking thRough self-Diagnosis

Abstract. This demonstration presents THESARD, the implementation of a self-diagnosis platform for SDN based networks. This platform automates the diagnosis by building and updating on-the-fly the fault propagation model of a streaming application. Self-healing actions are also shown to illustrate the recovery process for both the SDN underlying network and the streaming application, once the root cause is identified via this model.

Multi-domain Bandwidth on Demand service provisioning using SDN

Abstract. In this demo we will show the establishment of multi-domain BoD services across OpenFlow and non-OpenFlow domains, how the traffic is limited at the networking devices to enforce the QoS constraints, also selecting the optimal intra-domain paths during the process, and how the traffic is re-routed to alternative pre-computed paths in case of link-failure, always without disrupting the service provisioning.

NetIDE: All-in-one framework for next generation, composed SDN applications

Abstract. In this demo we will show of the NetIDE framework can be used to design, implement and test network applications, and also to support the network operator in providing new functions to operational SDN networks without any relevant service disruption.

Policy-based Restoration in IP/Optical Transport Networks

Abstract. In this demo we will illustrate an IP/Optical SDN control solution for transport networks, called network orchestrator, which orchestrates IP or optical restoration based on the policy explicitly requested by the client application. The policy is communicated via intents, as part of the constraints that must be satisfied for a service. The orchestrator uses these intents to identify the restoration mechanism to be employed in case of a failure.

OpenNetVM: Flexible, High Performance NFV

Abstract. This demo will present OpenNetVM, a highly efficient packet processing framework that greatly simplifies the development of network functions, as well as their management and optimization. OpenNetVM runs network functions in lightweight Docker containers that start in less than a second. We will demonstrate how the research community can easily build new network functions and rapidly deploy them to see their effectiveness in high performance network environments.

Posters

Tuesday, June 7 11:00AM – 11:30AM & 3:30PM – 4:00PM (Gayageum Hallway)

#	Title	Names & Affiliations
3	An Enhanced Flow Table Management Scheme Applying LRU and WRED Caching Algorithms	Eun-Do Kim (UST, Korea) Seungik Lee (ETRI, Korea) Yunchul Choi (ETRI, Korea) Myung-Ki Shin (ETRI, Korea) Hyoung-Jun Kim (ETRI, Korea)
4	Load and Path Aware Service Function Path Selection Algorithm in OpenDaylight	Dongeun Suh (Korea University, Korea) Jaewook Lee (Korea University, Korea) Hosung Baek (Korea University, Korea) Sangheon Pack (Korea University, Korea)
7	Programmable Switch based Inband Network Telemetry Usage Cases	Taesang Choi (ETRI, Korea) Sejun Song (UMKC, USA)
8	Efficient Big Data Transfer Service (BigDTS) using Data Oriented Forwarding	Daehee Kim (UWSP, USA) Sejun Song (UMKC, USA)
9	Optimum Embedding of Chains of VNFs considering Traffic Uncertainties and Delay Bounds	Varun S. Reddy (TUC, Germany) Andreas Baumgartner (TUC, Germany) Thomas Bauschert (TUC, Germany)

Wednesday Jun 8, 10:30AM – 11:00AM & 3:30PM – 4:00PM (Gayageum Hallway)

#	Title	Names & Affiliations
1	Self-adaptive SW Framework for Smart IoT Environments	Young-Joo Kim (ETRI, Korea) Sunghan Kim (ETRI, Korea) Jeong-Si Kim (ETRI, Korea) YungJoon Jung (ETRI, Korea)
2	Traffic Load-Based Routing Scheme in Software Defined Wireless Mesh Networks	Won Jin Lee (SKKU, Korea) Jung Wan Shin (SKKU, Korea) Hwi Young Lee (SKKU, Korea) Minsu Shin (SKKU, Korea) Min Young Chung (SKKU, Korea)
5	Toward an Energy Efficient Cooperative Software-Defined Sensor System	Haymanot Gebre-Amlak (UMKC, USA) Abdoh M. A. Jabbari (UMKC, USA) Seungjin Lee (UMKC, USA) Sejun Song (UMKC, USA)
6	Software-Defined Network Obfuscation and Hardening for Tactical IP Networks	Ponnada, Rahul (UMKC, USA) Sarah Choi (UMKC, USA) Seungjin Lee (UMKC, USA) Sejun Song (UMKC, USA)
10	Libera hypervisor: A network virtualization platform for Multi-tenant Data Center	Youngkeun Go (Korea University, Korea) Gyeongsik Yang (Korea University, Korea) Chuck Yoo (Korea University, Korea)

W1: Workshop on SDN and IoT (SDN-IoT 2016)

Monday, June 6, 2016 - 09:00~17:30
Home page: http://www.sdn-iot2016.umkc.edu
Location: Haeguem B Hall in 3F
Workshop Co-Chairs:
– Baek-Young Choi, *University of Missouri – Kansas City, USA*
– Rajeev Shorey, *Tata Consultancy Services, USA/India*
– Ravindran Kaliappa, *City University of New York, USA*

9:00-10:30AM	**Opening Remarks: Workshop Chairs** Software-Defined Fabrics for IoT at Scale (Invited), Alberto Leon-Carcia (University of Toronto - Canada) Stretching IoT Devices to Understand Human Interactions and Relations (Invited), Junehwa Song (KAIST – KOREA) Treating Software-Defined Networks Like Disk Arrays Zhiyuan Teo (Cornell University - USA) Ken Birman (Cornell University - USA) Robbert Van Renesse (Cornell University - USA) Noah Apthorpe (Cornell University - USA) Vasily Kuksenkov (Cornell University - USA)
10:30-11:00AM	**Coffee Break**
11:00-12:30PM	Session Chair: Taesang Choi (ETRI) IoT with Multi-hop Connectivity (Invited), Saewoong Bahk (Seoul National University - Korea) An Operator's perspective - SDN powered Mobile Edge Computing (MEC) (Invited), Ravinder Shergill (TELUS - Canada) SDN applications - the intent-based Northbound interface realisation for extended applications Minh Pham (University of Technology Sydney - Australia) Doan Hoang (University of Technology Sydney - Australia)
12:30-2:00PM	**Lunch**
2:00-3:30PM	Session Chair: Saewoong Bahk HOLA: Heuristic and Opportunistic Link Selection Algorithm for Energy Efficiency in Industrial Internet of Things (IIoT) Systems (Invited), Jeffrey Tew (Tata Consultancy Services Innovation Lab - USA) Counteracting UDP Flooding Attacks in SDN Hung-Chuan Wei, Yung-Hao Tung, Chia-Mu Yu (Yuan Ze University - Taiwan) Towards Wireless Sensor Network Softwarization Indrajit Acharyya, Adnan Al-Anbuky (Auckland University of Technology - New Zealand)
3:30-4:00PM	**Coffee Break**
4:00-5:30PM	Is Software Defined Networking (SDN) becoming vital to Internet-of-Things (IoT)? (Invited), Aloknath De (Samsung - India) Panel Topic: Challenges and Opportunities of SDN and IoT Moderator: Baek-Young Choi (University of Missouri - Kansas City - USA) Panelists: Steven Rim (Korea University & NAIM Networks - S. Korea) Victor Ki-Hoon Lyou (NAIM Networks - S. Korea) Ravinder Shergill (TELUS - Canada) Jeffrey Tew (Tata Consultancy Services Innovation Lab - USA)

W2 : Workshop on Open-Source Software Networking (OSSN)

Monday, June 6, 2016 - 09:00~17:30
Home page: http://opennetworking.kr/projects/ossn/wiki
Location: Haeguem A Hall in 3F
Workshop Co-Chairs:

– JongWon Kim, *Gwangju Institute of Science & Technology, Korea*

– Ivan Seskar, *Rutgers University, USA*

10:30-11:00AM	**Registration & Coffee Break**
11:00-12:30PM *Opening* *Full and Short Papers*	**Opening & SDN/NV - Chair: Prof. Sungwon Lee / Kyunghee University, Korea** OSSN Welcome JongWon Kim, GIST, Korea NDN.p4: Programming Information-Centric Data-Planes Salvatore Signorello, Radu State *University of Luxembourg, Luxemburg* Jérôme François, Olivier Festor, *INRIA Nancy - Grand Est, France* Experimenting with Control Operations in Software-Defined Infrastructures Stuart Clayman, Alex Galis, *University College London, Great Britain* Lefteris Mamatas, *University of Macedonia, Greece* OFMon: OpenFlow Monitoring System in ONOS Controllers Woojoong Kim, Jian Li, James Won-Ki Hong, Young-Joo Suh, *POSTECH, Korea*.
12:30-2:00PM	**Lunch**
2:00 - 3:30PM ***Keynote*** *Full and Short Papers*	**Keynote & SDN – Chair: Prof. Younghan Kim / Soongsil University, Korea** **Open-Source Networking with OpenStack and ONOS for Pragmatic Network/Security Solutions** Jaewoong Chung (CEO), *Atto Research, Korea* hvbench: An open and scalable SDN Network Hypervisor Benchmark Christian Sieber, Andreas Blenk, Arsany Basta, Wolfgang Kellerer, *Technische Universität München, Germany.* On Performance of OpenDaylight Clustering Dongeun Suh, Seokwon Jang, Sol Han, Sangheon Pack, *Korea University, Korea* Taehong Kim, Jiyoung Kwak, *ETRI, Korea.*
3:30-4:00PM	**Coffee Break**
4:00-5:30PM *Full and Short Papers*	**IoT-Cloud & SDN - Chair: Dr. Taesang Choi / ETRI, Korea** An Implementation of Hierarchical Service Function Chaining using OpenDaylight Platform Anh-Vu Vu, YoungHan Kim, *Soongsil University, Korea.* Design and Implementation of LISP Controller in ONOS Yoonseon Han, Seungho Ryu, Young-Joo Suh, James Won-Ki Hong, *POSTECH, Korea.* Leveraging Open-Source Software for Federated Multisite SDN-Cloud Playground Aris Risdianto, JongWon Kim, *Gwangju Institute of Science and Technology (GIST), Korea* Pang-Wei Tsai, Chu-Sing Yang, *National Cheng Kung University, Taiwan* Teck Chaw Ling, *University of Malaya, Malaysia* Enabling Operation Data Visibility for SmartX-mini IoT-Cloud Playground Seungryong Kim, JongWon Kim, *Gwangju Institute of Science and Technology(GIST), Korea*. LoRaCloud: LoRa Platform on OpenStack Jaeyoung So, Daehwan Kim, Hongseok Kim, Hyunseok Lee, Suwon Park, *Kwangwoon Univ, Korea.*

W3: Workshop on Software Defined 5G Networks (Soft5G 2016)

Friday, June 10, 2016 09:00~17:30
Home page: http://www.soft5g.org
Location: **Daeguem Hall in 3F**
Workshop Co-Chairs:
– Thomas Magedanz, *TU Berlin/Fraunhofer Institute FOKUS, Germany*
– Roberto Riggio, *CREATE-NET, Italy*
– Akihiro Nakao, *Tokyo University*
– Ashutosh Dutta, *AT&T Labs*

9:15-9:30AM	**Welcome Message from Workshop Chairs**
9:30-10:30AM	**Keynote 1:** How should operators challenge for the Soft-5G? Dr. Fumio Watanabe (KDDI)
10:30-11:00AM	**Coffee Break**
11:00-11:30AM	**Keynote 2:** Network-wide Distributed Computing for IoT era Jun Ogawa M.S. (Fujitsu)
11:30-12:30PM	**Technical Session 1:** (Chair: Alex Galis, UCL, UK) Lightweight Container-Based OpenEPC Deployment and its Evaluation Jorge Fontenla-Gonzalez (University of Vigo), Carlos Perez-Garrido (University of Vigo), Felipe Gil-Castiñeira (Universidade de Vigo), Francisco Javier Gonzalez Castaño (University of Vigo), Carlos Giraldo-Rodriguez (Gradiant) 802.11ah LPWA Interworking Mukesh Taneja (Cisco)
12:30-1:30PM	**Lunch**
1:30-2:30PM	**Keynote 3:** Mobile Cloud Networking - The Pioneer of Virtualized Mobile Networks Thomas Bohnert (ZHAW)
2:30-3:30PM	**Technical Session 2:** (Chair: Alex Galis, UCL, UK) System architecture and aspects of SESAME: Small cEllS coordinAtion for Multi-tenancy and Edge services Ioannis Giannoulakis (Demokritos), George Xilouris (N.C.S.R Demokritos), Michail Alexandros Kourtis (NCSR Demokritos), Emmanouil Kafetzakis (Orion innovations), Jose Oscar Fajardo (University of the Basque Country), Pouria Sayyad Khodashenas (i2CAT Foundation), Antonino Albanese (Italtel), Haralambos Mouratidis(Univ. of Brighton), Vassilios Vassilakis(Univ. of Brighton) Empirical Comparison of Virtualised and Bare-Metal Switching for SDN-based 5G Communication in Critical Infrastructures Fabian Kurtz, Nils Dorsch, Christian Wietfeld (TU Dortmund University)
3:30-4:00AM	**Coffee Break**
4:00-5:30PM	**Panel Discussion: *"Towards Distributed SDN/NFV/MEC Testbeds for 5G Prototyping"*** Panel Chair: Dr. Stefan Covaci (TU Berlin) ● How important will be SDN/NFV/MEC concepts and technologies for 5G? ● How to test and prototype 5G without existing standards? ● What is the status of definition and deployment of 5G Testbeds around the globe? ● Local versus distributed versus federated testbeds - What might be the role of the IEEE Federated SDN Testbed Initiative? ● Questions from the audience Panelists: ● Jun Ogawa M.S. (Fujitsu) ● Dr. Fumio Watanabe (KDDI) ● Thomas Bohnert (ZHAW) ● Prof. Alex Galis (UCL)

W4: Workshop on Security in Virtualized Networks (Sec-VirtNet 2016)

Friday, June 10, 2016 09:00~17:30
Home page: http://www.sec-virtnet.org
Location: **Haeguem B Hall in 3F**
Workshop Co-Chairs:
- Stéphane Betgé-Brezetz, *Alcatel-Lucent Bell Labs, France*
- Emmanuel Dotaro, *Thales, France*
- Hervé Debar, *Telecom SudParis, France*
- Matteo Signorini, *Nokia Bell Labs, France*

9:00-10:30AM	**Keynote Speakers**
	SDN – An opportunity for security by design? Sandra Scott-Hayward - Queen's University, Belfast, Northern Ireland
	SDSecurity– Models, metrics, assessment, and virtualization Doan Hoang - University of Technology Sydney, Australia
10:30-11:00AM	**Coffee Break**
11:00AM-12:30PM	**Session 1**
	Attacks against Network Functions Virtualization and SoftwareDefined Networking: State-of-the-art François Reynaud, François-Xavier Aguessy, Olivier Bettan, Mathieu Bouet, Vania Conan
	Control-plane Isolation and Recovery for a Secure SDN Architecture Takayuki Sasaki,Daniele Asoni, Adrian Perrig
	Securing Data Planes in Software-Defined Networks Tzu-Wei Chao, Yu-Ming Ke, Bo-Han Chen, Jhu-Lin Chen, Chen Jung Hsieh, Shao-Chuan Lee, Hsu-Chun Hsiao
12:30-2:00PM	**Lunch**
2:00-3:30PM	**Keynote Speakers**
	Security Issues in Openstack Cloud Souhwan Jung - Soongsil University, Korea
	Trusted platform security for SDN Brent Byunghoon Kang – KAIST, Korea
3:30-4:00PM	**Coffee Break**
4:00-5:30PM	**Session 2**
	FASSKEY: A Secure and Convenient Authentication System John Milburn, FASSKEY Technology, Heejo Lee, Korea University, Korea
	SRV: Switch-based Rules Verification in Software-defined Networking Yuchia Tseng - Paris Descartes University, Zonghua Zhang - Institute Mines-Telecom Lille/TELECOM Lille and CNRS UMR 5157 SAMOVAR Lab, Farid Naït-Abdesselam - Paris Descartes University
	Interactive Analysis of SDN-driven defence against Distributed Denial of Service attacks Ralph Koning, Ben de Graaff, Cees de Laat, Robert Meijer, Paola Grosso

Tutorials

Tutorial #1, #2

Monday June 6, 2016 – 9:00-17:30 (Location: Bipa Hall in 3F)

End-to-End Orchestration in Multi-tier Clouds based on Software-Defined Infrastructure

Hadi Bannazadeh, Byungchul Park, and Alberto Leon-Garcia
NSERC SAVI Strategic Network and University of Toronto, Canada

Abstract: An outstanding practical challenge is how to orchestrate applications end-to-end across distributed cloud computing and software-defined network infrastructures. In this tutorial, we work through a series of hands-on exercises that show how end-to-end orchestration is done in the SAVI testbed that integrates OpenStack and OpenFlow in a multi-tier computing cloud based on software-defined infrastructure. The goal of the tutorial is to prepare participants to use the SAVI testbed in their research, for example prototyping future Internet protocols or applications in a real cloud environment. The tutorial has four parts: 1) SAVI Basics--Introduction to SAVI testbed and basic operations; 2) E2E Orchestration & Service Chaining--Layer-2 backbone WAN connectivity between SAVI nodes, and orchestration and service chaining for NFV in SAVI testbed; 3) MonArch Monitoring and Analytics on a big data framework; and 4) Legacy and Hybrid Infrastructures--deploying SAVI-SDI features in legacy environments. By the end of the tutorial attendees will be able to orchestrate, monitor and analyze resources for novel services. The exercises will require participants to bring a laptop to the tutorial. No specific software is required.

Tutorial #3

Monday June 6, 2016 – 9:00-12:30 (Location: Daeguem Hall in 3F)

NFV Management and Orchestration in the Age of 5G

Roberto Riggio, *CREATE NET, Italy*

Abstract: NFV is a potential candidate for deploying and managing future networks. Indeed by turning network functions into software modules and by deploying them on top of general purpose computing and networking infrastructure NFV can make networks cheaper to deploy and to manage. However, in order to achieve its full potential, NFV needs to extend its reach also to the radio access segment. Here Mobile Virtual Network Operators shall be allowed to request radio access VNFs with custom resource allocation solutions. Such requirement raises several challenges in terms of performance isolation and resource provisioning. This tutorial will provide an overview on NFV management and orchestration in wired, wireless, and converged networks. The NFV fundamentals, such as network/computing virtualization and software defined networking will be presented and discussed. The different aspects of NFV orchestration, such as network service composition, lifecycle management, and network service scaling will also be introduced. Different NFV architectures and proposals will be discussed and their impact on the orchestration task will be presented. An emphasis on 5G mobile networks and a short introduction on converged optical/wireless systems will be given.

Tutorial #4

Monday June 6, 2016 – 14:00-17:30 (Location: Daeguem Hall in 3F)

Programming Data-Planes in P4, a High-Level Language for Packet Processors

Salvatore Signorello, Radu State and Jérôme François
University of Luxembourg, Luxembourg, and INRIA, France

Abstract: P4 was originally proposed as a candidate language for the future programmable network devices. P4's goals are protocol independence, target independence and reconfigurability in the field. Since the inception, the P4 language has generated a notable momentum across both the industry and academia, gathering together the biggest network operators and some enthusiastic academics in a non-profit consortium. The potential of the language to describe common networking tasks has already been showcased by some preliminary works. Today, an hectic ecosystem of open source software tools is maintained and developed by the P4 community. This tutorial will introduce the audience to the language, providing them with the knowledge necessary to develop and prototype their own ideas in P4. Further, the tutorial aims at encouraging the audience to join the P4 community and contribute to the language development. Attendees need to bring a laptop. They will be provided with a virtual image (in the ova format) containing the development environment needed to run the assignments.

To run the virtual machine, VirtualBox must be pre-installed by the participants. 10GB of free disk space is required to store and run the virtual image in VirtualBox.

Tutorial #5, #6

Friday June 10, 2016 – 9:00-17:30 (Location: Bipa Hall in 3F)

The Central Office Rearchitected as a Data Center (CORD)

Ali AlShabibi and Charles Chan, *Open Networking Lab, USA*

Abstract: Network operators face significant challenges supporting ever-increasing bandwidth demands and ever-increasing service expectations. For example, AT&T has seen data traffic increase by 100,000 percent in the last eight years, and plans are now underway to roll out ultrafast fiber and access to 100 cities across the US. At the same time, introducing a new feature often takes months (waiting for the next vendor product release) and sometimes years (waiting for the standardization process to run its course). In response to these challenges, network operators are looking for ways to benefit from both the economies of scale (infrastructure constructed from a few commodity building blocks) and the agility (the ability to rapidly deploy and elastically scale services) that commodity cloud providers enjoy today. Cloud economies and agility are especially needed at the edge of the operator network—in the Telco Central Office (CO) —which contains a diverse collection of purpose-built devices, assembled over fifty years, with little coherent or unifying architecture. For example, AT&T currently operates 4,700 Central Offices, some of which contain up to 300 unique hardware appliances. This makes them a source of significant CAPEX and OPEX, as well as a barrier to rapid innovation. This tutorial describes CORD , an architecture for the Telco Central Office that combines SDN, NFV, and elastic cloud services—all running on commodity hardware—to build cost-effective, agile networks with significantly lower CAPEX/OPEX and to enable rapid service creation and monetization.

Tutorial #7

Friday June 10, 2016 – 9:00-12:30 (Location: Haeguem A Hall in 3F)

Powering IoT with Cloud & NFV for Cost Efficient and Agile Applications and Services Provisioning

Roch Glitho *Concordia University, Montreal, Canada*

Abstract: The Internet of Things (IoT) exploits the ubiquity of objects such as sensors and actuators which could be networked and collaborate for meeting specific goals. The expected applications and services are numerous and cover all aspects of business and everyday life. However, provisioning these applications and services in a cost efficient and agile manner remains an uphill task. The deployment of wireless sensor networks for instance, remains applications/services specific, precluding cost efficiency through re-use by new applications and services. The deployment of middle boxes services such as IoT gateways also remains quite cumbersome. Cloud computing and NFV, emerging paradigms for cost efficient and agile applications and services provisioning, are poised to change the current state of affairs. This tutorial in three parts reviews the state of the art and discusses the research directions. The first part introduces the basics of applications and services provisioning, IoT, cloud computing and NFV. The second part is devoted to cloud based IoT applications and services provisioning. The approaches proposed so far for IoT virtualization to enable cost efficiency are reviewed. The works on IoT platforms as a Service (PaaS) for rapid and easy applications and services provisioning are also discussed. A concrete cloud based – IoT fire detection and fighting application we have prototyped in our lab is presented as a case study. In the last part, NFV based IoT applications and service provisioning is reviewed with a focus on VNF chaining and deployment issues. We conclude by discussing research directions including how fog computing could complement cloud and NFV for unleashing even more powerful IoT applications and services.

Tutorial #8

Friday June 10, 2016 – 14:00-17:30 (Location: Haeguem A Hall in 3F)

Software Defined Network Security – In Practice

Sandra Scott-Hayward, Changhoon Yoon (CY), and Seungsoo Lee (SL)
Queen's University Belfast, Northern Ireland, and KAIST, Korea

Abstract: This tutorial will provide a comprehensive overview of the state of Software Defined Network (SDN) Security. The tutorial will be presented in clearly defined sections, outlined as follows: the state of SDN security; attacks and vulnerabilities in SDN; solutions to security Issues in SDN; controller security; and network security enhancements using SDN.

Exhibitions

Huawei Softcom, Huawei	
HUAWEI	We will exhibit Huawei Softcom E2E solution. This solution covers SDN/NFV implementation from core network to access network. Particularly for this exhibition, we will show the E2E architecture of Softcom, and SDN/NFV-based core network solution as well as SDN/NFV-based edge network solution. For core network, we will show IMS's implementation with NFV. For edge network, we will show EPC's implementation with SDN/NFV. Besides, the MANO solution, which is critical for SDN/NFV commercial operation, will also be shown. We understand industry's concern about network evolution to SDN/NFV, so we will also show our viewpoints on this regard.
T-OVEN & T-PLATE: Provide customized network service optimized for users – SK telecom	
SK telecom	[T-OVEN] SK Telecom's Orchestrator for the virtualized end-to-end network T-OVEN is the carrier-grade NFV orchestrator that manages heterogeneous virtualized equipment to realize a software-based network on demand (Creating a software-based network takes only a few hours, as opposed to the conventional hardware-based network, which took a number of months to build). Our world's first NFV Orchestrator was already deployed with both IoT vEPC and vIMS in the commercial LTE networks('15.3Q). [T-PLATE] SK Telecom's Platform for the tailored network service Based on T-OVEN, T-PLATE delivers optimal customer experiences by tailoring the network according to the customer's preference, time of use, location and situation. It will offer "logical"network optimized for a wide range of customers (B2B/B2C/B2B2C) in the most cost-effective manner by realizing a LTE network as a service.
SDN-enabled Mobile Packet Core, Hewlett Packard Enterprise	
Hewlett Packard Enterprise	Do you need to add services and network function virtualization to your mobile service offerings? HPE ContexNet is an OpenDaylight-based carrier-grade SDN fabric. It enables network operators to quickly add services customized per subscriber flow, increase network efficiency and improve network management and visibility HPE ContexNet implements virtual connectivity. It maps flows to functions dynamically based on end-user policy, carrier network conditions, network element availability and location, without any pre-provisioning. The role of ContexNet is to offer logical connectivity on top of the physical network. It dynamically steers traffic to network functions in the right sequence for each end-user. This capability enables ContexNet to link, chain and load balance virtual network functions, thus maximizing concurrency and leveraging elastic allocation of virtual network function instances while protecting flows from crossing tenancy boundaries
ATHENE, ATTO Research	
ATTO RESEARCH 아토리서치	ATHENE is an NFV platform which can apply to various types of industries and networks. With this platform, the network operator and administrator can set up the network functions whatever they want. When the network traffic increases in sudden or any kinds of network threat happen, this platform makes you take appropriate actions in a minute. The NFV Platform, ATHENE helps you to construct the most stable network environment with an agile and unconstrained service chaining. ATHENE cluster architecture and S-VNF platform feature enable the administrator to build a resilient and unconstrained service chaining. Various network functions of the chaining service are operated by the virtual machine basically. Whenever any network traffic comes into the ATHENE, the traffic is controlled by the installed rules in Open vSwitch (OVS), and it may be forwarded to the virtual machine which operates the corresponding VNF. All created VNFs are connected together using their own vPort and vLink logically to construct the service chaining. Agile and unconstrained service chaining feature of ATHENE helps the users to build any network whatever they want and, it brings out the best optimal network performance.
PRISM : Softwarization of hardware and networking functions for cloud computing, KulKloud	
KulKloud	The PRISM is designed to introduce new levels of software flexibility and programmability in large-scale network environments. The PRISM software environment advances the functionality of modern networks by disaggregating network software and Linux abstraction, so customers have more choice in how software is used throughout IT operations. PRISM gives customers a future-ready springboard to innovate their networks and data center infrastructure more quickly and consistently, affording customers greater efficiency and capability at scale. In this exhibition, we will present PRISM based OpenStack network and cloud resource orchestration using SFA (Slice Federation Architecture). During exhibition we will show how user can allocate the cloud resources through SFA and how the network can be softwarization on top of white box switches. Finally, we will demonstrate how user can easily develop and deploy new network function in PRISM and performance testing with real traffic generation

Venue

IEEE NetSoft 2016 will be held at **The-K Hotel Seoul, Korea**

The-K Hotel Seoul

70 Baumoe-ro 12-gil, Seocho-gu
Seoul, Korea

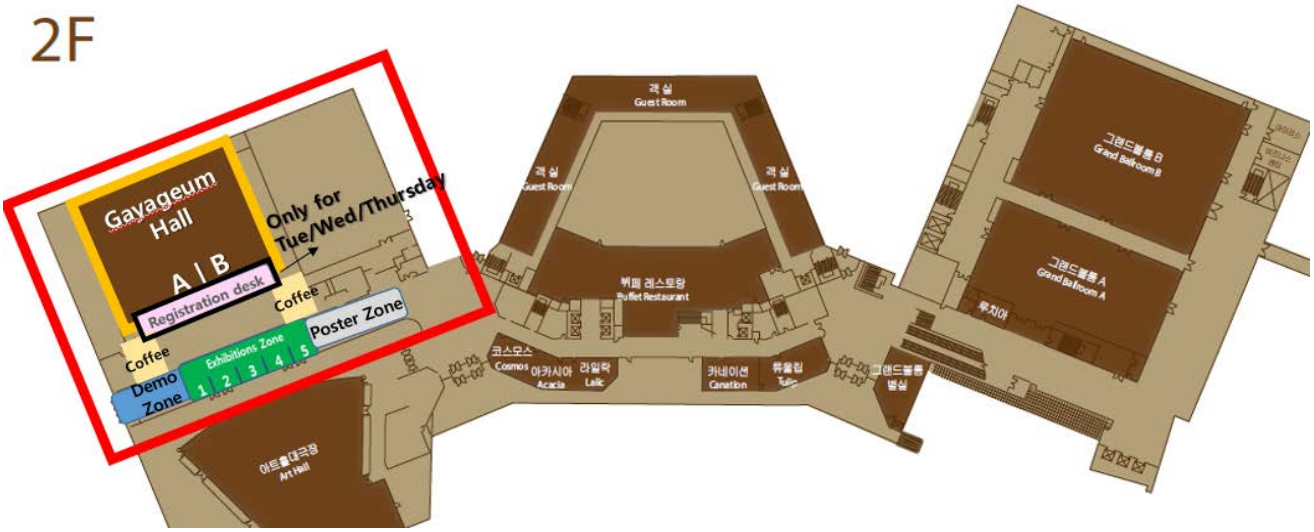
Hotel Information

	The-K Hotel Seoul
Address	(06769) 70, Baumoe-ro 12-gil, Seocho-gu, Seoul
Tel	+82-2-571-8100
Fax	+82-2-571-7055
Home page	www.thek-hotel.co.kr
Check in/out time	Check in – after 14 :00 / Check out – before 12:00
Structure	Basement 1F – 11th Floor
Car Park	Maximum 1,200 spots
Number of Rooms	252
Room Amenities	Internet Service, Personal Voice inbox, Morning call, Electronic Lock Mini Bar, Bath gown, Hair dryer, Cable TV, Power outlets(110V, 220V)
Hotel Facilities	Restaurants & Bar, Lounge, Fitness Club, Business Center, Banquet & Meeting Room
Restaurants	Italian Bistro 'Uccello', Buffet 'The park', Japanese restaurant

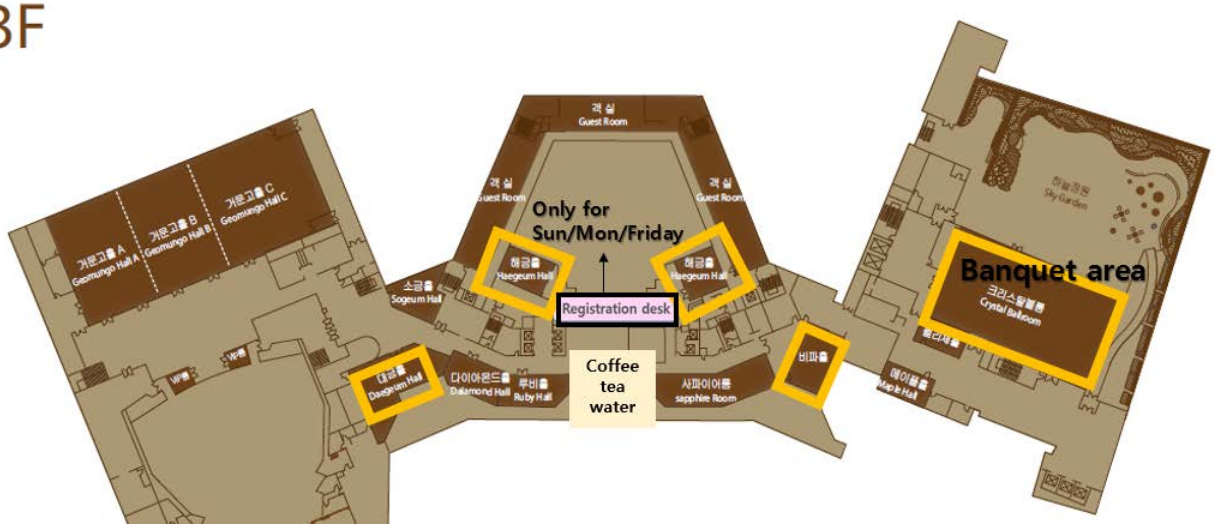
Hotel Layout

1F

2F



3F



The K Hotel SEOUL

Reservation Form / IEEE NetSoft 2016

1. Event Information

Name of Event	**IEEE NetSoft 2016**	**Period**	
Organizer		**Contact**	

2. Guest Information

☐ Ms. ☐ Mr.	**First Name:**		**Middle :**	**Last :**
Address				
	Zip code		**Tel**	
Contact	**Mobile**		**Fax**	
E-mail				

3. Credit Card Details

*** Please mark which service expense are covered by Credit Card**

☐ **ONLY for guarantee** ☐ **All charges** ☐ **Room Only**

☐ **Room & Breakfast** ☐ **Other (** **)**

Card Type	☐ **Amex**	☐ **Diners**	☐ **Euro Card**	☐ **JCB**	☐ **Master**	☐ **VISA**
Card No.						
CVC Code	* Visa/Master Card Only		**Name of the Cardholder**			
Exp. Date			**Signature**			

4. Room Type and Price

Room type	**Check-In**	**Check-Out**	**Nights**	**No. of Room**	**PAX**	
					Adult	**Child**
	DD-MM-YYY	**DD-MM-YYY**				

* **Room Rate** Business Double : ☐ 158,400 Deluxe Twin : ☐ 145,200 (including tax)

* **Breakfast is not included** (**KRW 26,100** including tax & service charges)
Location: Main Building 1F, UCCELLO (7:00AM~09:30AM)

* **Special room rates** are eligible only for the **" IEEE NetSoft 2016"** attendees.
* All room rates include **10% service charge and 10% government tax**.
* **Check-in time is 14:00 pm & Check-out is 12:00 pm**.
* **For early check-in and late check-out**, an extra charge would be added according to hotel regulations.
(Up to 3 hours 30%, 3 to 6hours 50%, after 6 hours 100% of room charge)
* Other facilities: Italian, Japanese & Buffet restaurants, Bar, Bakery, Coffee shop, Theater, Golf range, Sauna, Hair Salon, Convenience store, Souvenir shop 'Zen'

5. Guarantee & Cancellation Policy

* All policies can be kept updating according to hotel policies.
* At the time of booking, a **credit card is required as a guarantee for your reservation**
* If your booking is cancelled
- Within **30 days ~ 3 days** of the arrival, there will be 30% of the total charges.
- Within **3days ~ 1day** of the arrival, there will be 80% of the total charges.
- On arrival day or a **NO SHOW**, there will be 100% of the total charges.

The K Hotel SEOUL

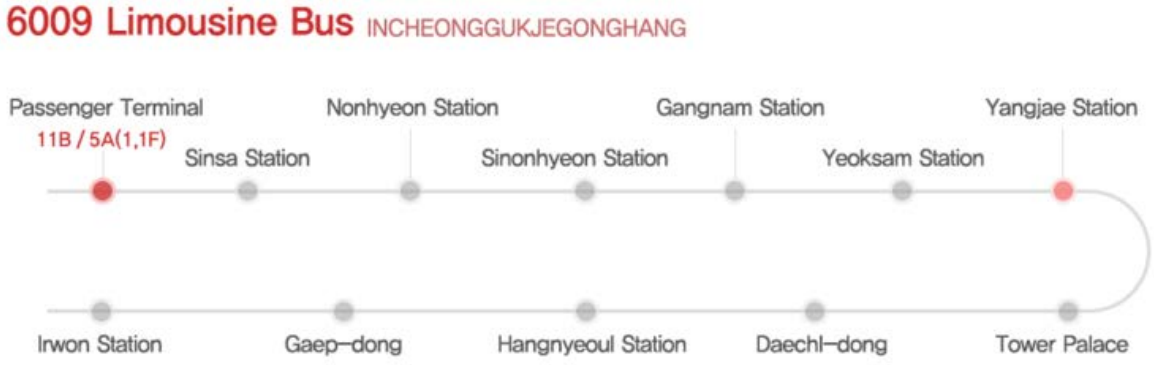
Address: 70, Baumoe-ro 12-gil, Seocho-gu, Seoul
Phone: +82 (0)2 571-8100
fax: + 82(0)2 571-8104
e-mail : reservation@thek-hotel.co.kr

Transportation

1. Incheon Int'l Airport -> The K-Hotel Seoul

1-a. By 6009 Limousine Bus (detailed schedule of the limousine bus)

Boarding Place	5A or 11B at the 1st floor		
Bus stop to get off	Yangjae Station Exit 5 (opposite of Hilstate Gallery)		
Cost	Adult ₩15,000 / Child ₩11,000 (6~12 yrs)		
Travel Time	Approx. 70 minutes		
Interval between buses	15~25 minutes		
First Departure to the City	4:05	**Last Departure to the City**	21:00



1-b. By 6500 Limousine Bus

Boarding Place	5A or 11B at the 1st floor
Bus stop to get off	The K-Hotel (In front of Convention Center Building)
Cost	Adult ₩15,000 / Child ₩11,000 (6~12 yrs)
Travel Time	Approx. 80 minutes
Interval between buses	240 minutes
Departure to the Venue	09:20 / 13:20 / 17:20 / 21:20

6500 Route Information

1-c. By Taxi

Estimated Cost	70,000~80,000 Won
Travel Time	Approx. 60 minutes

2. Gimpo Int'l Airport -> The K-Hotel Seoul

2-a. By Subway & Shuttle Bus

Take Line 9 at Kimpo Station → Transfer to Line 3 at Gosok Terminal Station → Transfer to Sinbundang Line at **Yangjae Station** (**or Get off at Exit No. 3 of the station to take the shuttle bus**) → **Get off at Yangjae Citizen's Forest Station** → Exit No. 5 (5 minutes on foot) / Exit No. 2 (To take the shuttle bus)	
Time of travel	Approx. 60 minutes
Cost	1,450 Won (Cash)

Time	Hotel ⇒ Yangjae Station	Yangjae Station ⇒ Hotel
06:00	20, 50 Min.	30 Min.
07:00 ~ 17:00	20, 50 Min.	00, 30 Min.
18:00 ~ 19:00	15, 45 Min.	10, 30 Min.
20:00 ~ 22:00	20, 50 Min.	00, 30 Min.
23:00	–	00 Min.

2-b. By Taxi

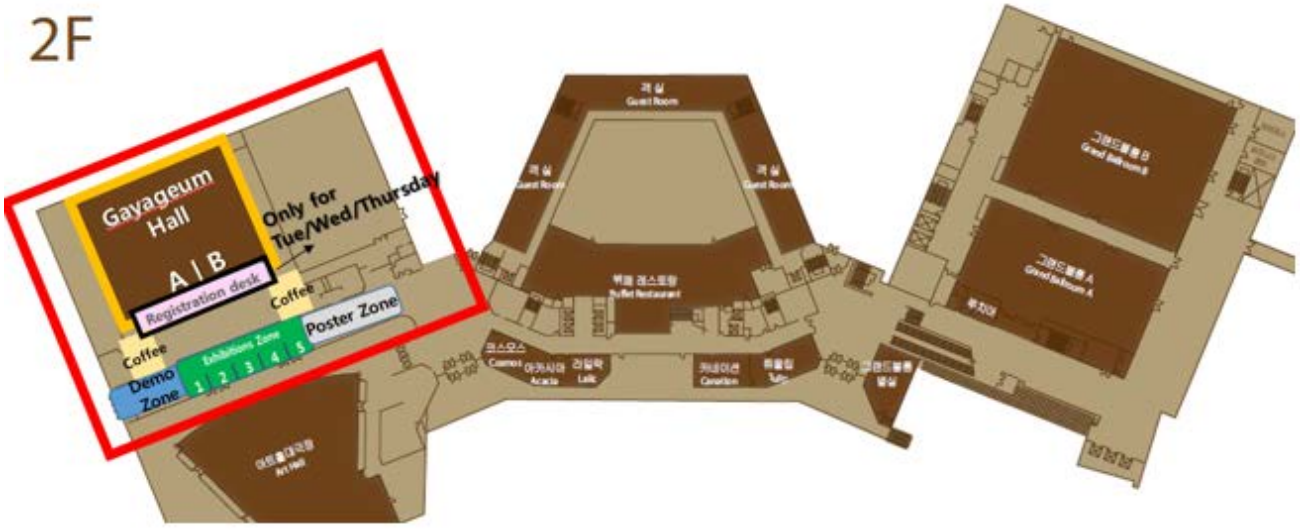
Estimated Fare	30,000 Won
Time of Travel	Approx. 60 minutes

Registration

* All attendees and accompanying guests must register and receive a conference badge in order to participate in conference activities. Photo ID is required. Individuals are responsible for picking up their own registration packages. No attendee will be allowed to pick up registration for their colleagues.

* Local registration hours for the conference in The K-hotel Seoul:

DAY	DATE	Location	TIME
Tue / Wed / Thursday	7-9 June	2F Registration Desk	08:00 – 18:00



DAY	DATE	Location	TIME
Sun / Mon / Friday	5, 6, 10 June	3F Registration Desk	08:00 – 18:00 (Sun. 16:00 – 18:30)

Local Information

Seoul, Korea

About Korea

Visitors will discover its rich natural beauty combined with a unique cultural and historical heritage. After a rapid modernization in recent decades, Koreans still maintain their traditional values such as hospitality and the time-honored Confucian respect for the elderly.

Traveling in Korea is enjoyable all year round thanks to its distinct four seasons and the beautiful changes of nature. In spring (March to May), mountains and fields are in bloom with cherry blossoms, forsythias, azaleas, magnolias and lilacs. In summer (June to early September), luxuriant forests, bright green fields and the cobalt blue sea draw people outdoors. In autumn (September to November), cool temperatures and a clear sky make it the most pleasant time of the year in Korea. The mountains all over the country are covered in red and yellow blazing autumn foliage. In winter (December to February), mountain slopes become the place for skiing and snow festivals. Winter in Korea is another delightful season of great amusement.

About Seoul

Seoul is the capital of Korea with over 600 years of history. It is the heart of Korea's culture and education as well as politics and economics. Seoul is home to many old historic sites like Gyeongbokgung and Changdeokgung Palaces, and places of traditional culture like Bukchon Hanok Village, Insa-dong, and Namdaemun Market. The shopping and entertainment districts of Myeongdong and Apgujeong, and Asia's largest underground shopping center COEX Mall also draw a large number of tourists every year. The Hangang River, which runs through the center of the city, is also a distinctive landscape of Seoul that offers a myriad of resting areas for citizens.

Visa Information

Any foreign visitors wishing to enter Korea must have a valid passport and obtain a Korea visa before visiting. However, people of countries below who want to visit Korea temporarily are permitted to enter without a visa.

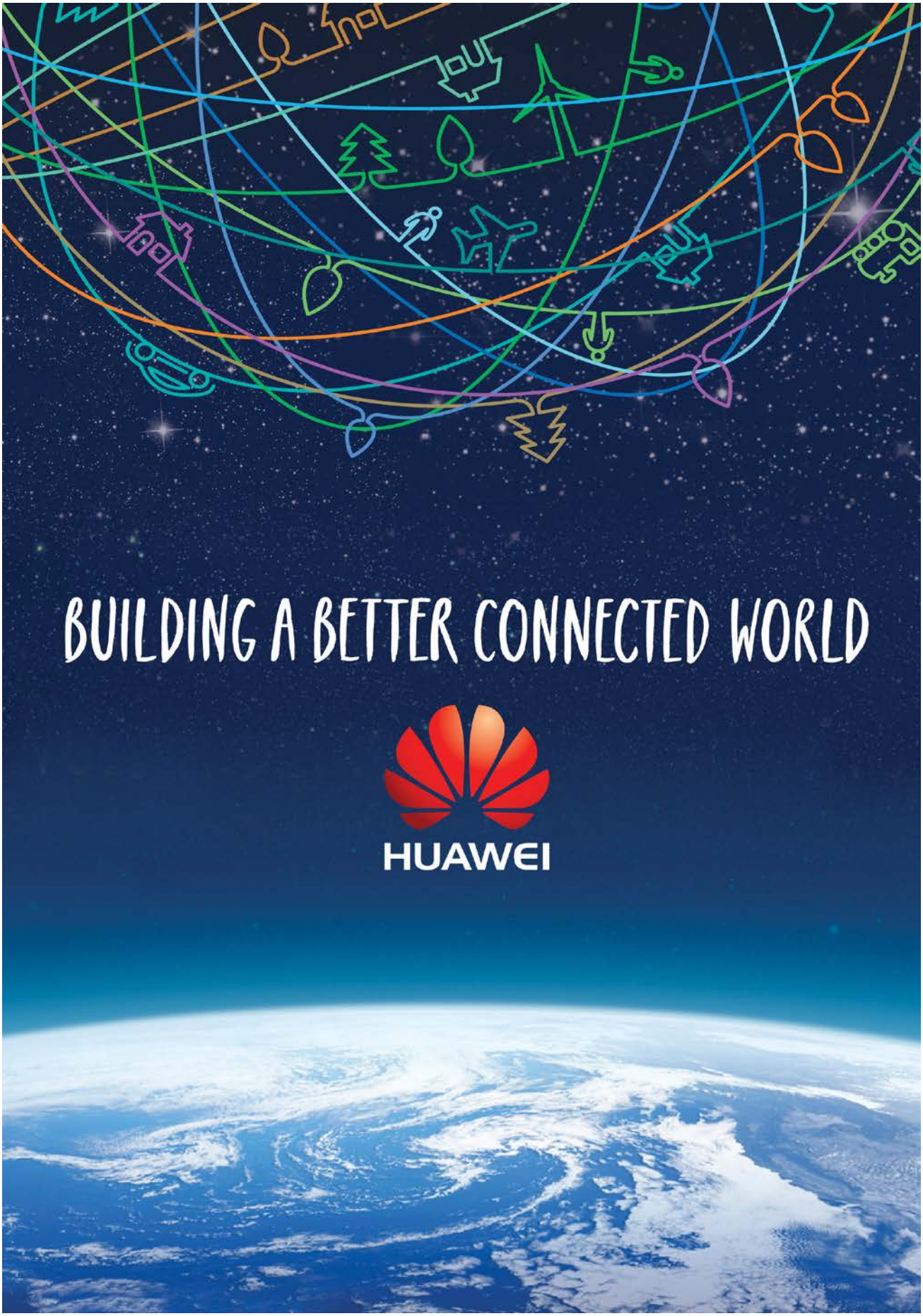
Designated visa-free entry

- Considering international convention, mutuality doctrine, national profit and other such factors, certain countries are granted visa-free entry permissions.
- Nationals of the following countries are allowed up to 30 days of visa-free sojourn for tourism or visitation
  Exceptions: Canada is allowed up to 6 months, and United States, Australia, Hong Kong, Slovenia, and Japan are allowed up to 90 days.
- Countries that are granted visa-free entry for diplomatic, government official, and general passport holders

Continent	Countries/ regions
Asia	Macao (90 days), Brunei, Saudi Arabia, Arab Emirates, Oman, Japan (90 days), Qatar, Taiwan (90 days), Hong Kong (90 days), Kuwait (90 days), Bahrain [11 countries] for only diplomatic and government official passport holders: Indonesia, Lebanon [2 countries]
North America	United States(90 days), Canada (6 months) [2 countries]
South America	Guyana, Argentina, Ecuador(90),Paraguay, Honduras [5 countries]
Europe	Monaco, Vatican, Bosnia-Herzegovina, Albania, Cyprus, San Marino, Serbia(90), Montenegro, Slovenia (90 days), Andorra, Croatia(90) [11 countries]
Oceania	Guam, Nauru, New Caledonia, Micronesia, Samoa, Solomon Islands, Kiribati, Fiji, Australia (90 days), Marshall Islands, Palau, Tuvalu, Tonga [13 countries]
Africa	South Africa, Seychelles, Mauritius, Swaziland, Egypt (5 Countries)

Countries under Visa Waiver Agreements

- Nationals of visa waiver countries can enter Korea without a visa as long as the purpose of their visit is tourism or temporary visit. If they want to engage in profitable activities such as employment, they must apply for a Korean visa suitable for their purpose.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